In a preferred embodiment, the sensors **2392**,**2394** are uniformly distributed throughout the active matrix. For example, each pixel element, or a selected group of pixel elements can have an associated sensor **2392**,**2394**. The sensor to pixel ratio need not be one-to-one however. In another material embodiment, the sensors **2392**,**2394** are distributed around the perimeter of the active matrix.

FIG. **65** is a schematic diagram of a projection head-mounted display **2500** shown partially in cross section. Shown is a housing **2510** separated from a user's head by a foam pad **2515**. The housing **2510** is preferably fabricated from plastic but other lightweight materials can also be used. A backlight **2520** projects light through a display panel **2530** to form an image. The image is operated on by an optics system **2550** similar to that described in the aforementioned U.S. Pat. No. 4,859,031. Illustrated is a concave partially reflective mirror **2512** and cholesteric liquid crystal (CLC) element **2554**.

The image is circularly polarized by the display panel **2530** and is transmitted through the concave mirror **2512**. The image is then reflected by the CLC element **2554** back toward the concave mirror **2512**, which reverses the polarization and reflects the image back toward the CLC element **2554**. The CLC element **2554** now transmits the reverse polarized image. The light may be reflected once or multiple times from the concave mirror **2512** to correctly orient the polarization of the image for transmission through the CLC element **2554**.

The image is then reflected from a viewing surface **2580** toward the user's eyes. The viewing surface **2580** is preferably a partially transmissive mirror that overlays the generated image over the images of real objects in the wearer's field of view.

Circuitry for driving the display panel **2530** is located both on the display panel **2530** and on a printed circuit board **2560** disposed within the housing **2510**. Alternatively, circuit elements may be located elsewhere on the headpiece or on the user's body. A flexible flat cable **2565** interconnects the circuit board **2560** with the display **2530**. A focus adjust mechanism **2570** is provided for use by the wearer. The display panel **2530** can be an active matrix liquid crystal display as described in greater detail above.

FIG. **66** is a perspective view of the projection display unit of FIG. **65** worn as a monocle by a user. The display unit **2500** is secured to the wearer's head by a headband **2502** or by other head mounting support systems described elsewhere herein, including hardhats and face protectors. The focus adjust mechanism **2570** is a knob that can be turned by the wearer. When not in use, the partially transmissive mirror **2580** can be folded out of position into the display unit **2500**.

FIG. **67** is a perspective view of a binocular reflective head-mounted display. As illustrated, two display units **2500***a*', **2500***b*' are coupled together and fastened to the wearer's head by a support such as headband **2502**'. The focus adjust mechanisms **2570***a*', **2570***b*' are slide mechanisms. Each eye has a corresponding partially transmissive mirror **2580***a*', **2580***b*'.

FIGS. **68**-**70** illustrate other preferred embodiments of a direct view display system. Light from a display device **2500** is represented by light ray **2615**. The light ray **2615** from the display **2500** can be combined with ambient light **2690** before becoming incident on a viewer's eye **2600**. Thus, the image created by the display device **2500** appears to the viewer to float in the viewer's field of vision.

There are various means of combining the display image **2615** with the ambient image **2690**, which will now be described. FIG. **68** illustrates a preferred embodiment of the invention using a prism **2710** to combine the images. The hypotenuse of the prism can be coated with a partial reflector or electrochromatic material **2712** to attenuate ambient light **2690**. FIG. **69** illustrates a preferred embodiment of the invention using a lenticular structure **2720** as an image combiner. The gradings are spaced such that the eye **2600** cannot distinguish lines in the structure **2620**. In a preferred embodiment, the grating density is greater than or equal to 150 per inch and can be color selective so as to redirect only a certain color or colors that will be easily viewed by the user relative to the ambient light. FIG. **70** is similar to the lenticular structure in FIG. **69** except that a Fresnel lenticular structure **2730** is used. In both lenticular structures **2720**, **2730**, the flat surface **2722**, **2732** can be coated with a partial reflector or electrochromatic material. In either of FIGS. **68**-**70**, the display system **2500** is mounted adjacent to the viewer's head. In a preferred embodiment of the invention, the display device **2500** can alternatively be mounted adjacent to the sides of the viewer's head.

Equivalents

Those skilled in the art will know, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein. These and all other equivalents are intended to be encompassed by the following claims.

What is claimed is:

1. A portable wireless communications device capable of being carried by a user comprising:

a) a portable housing enclosing an image sensor;

b) a wireless receiver within the housing for receiving wireless audio-video data;

c) a display module attached to the housing, the display module comprising:

i) an active matrix display panel-having an active matrix circuit, an array of at least 300,000 pixel electrodes and a pixel electrode density of at least about 1,200,000 per square inch;

ii) a lens magnifying an image displayed on the display panel for viewing by the user; and

iii) a display driver circuit coupled to the active matrix circuit, the display driver circuit forming images on the display panel from the received image data;

d) a processing unit mounted within the housing and coupled between the wireless receiver and the display driver circuit, a global positioning satellite sensor also incorporated therein and coupled to the processing unit for determining position of the user; and

e) a battery carried by the housing for powering the processing unit, the wireless receiver, the display panel, and the display driver circuit.

2. The device of claim **1**, wherein the display module rotates relative to the housing.

3. The device of claim **1**, wherein the housing comprises a head mounted support.

4. The device of claim **1**, wherein the display panel is a video display.

5. The device of claim **1**, wherein the display panel has an array of at least 640×480 pixel electrodes.

6. The device of claim **1**, further comprising a cholesteric liquid crystal element along an optical path between the display panel and the lens.

7. The device of claim **1**, further comprising a video processing circuit within the housing.

8. The device of claim **1**, further comprising a port coupled to the housing for receiving a memory card.